H53J-1898 - Tracking Urban Development Impacts on Austin, Texas, Area Watersheds Using Endmember Elemental (F^-, Cl^-) and Isotopic ($^{87}Sr/^{86}Sr$) Tools

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13:40 - 18:00

Moscone South - Poster Hall

Abstract

Understanding the resilience of freshwater resources is imperative as urban development continues to degrade freshwater quality and quantity. Climate change and population growth alter supplies of available freshwater, making it increasingly important to quantify and mitigate acute urban water supply and quality challenges in the 21st century. We use geochemical and isotopic ($^{87}Sr/^{86}Sr$) tools to ascertain water sources introduced via urbanization (i.e., municipal water), and how the proportional contribution of each source evolves as urbanization continues. Relationships between municipal water indicators (F^-, Cl^-, $^{87}Sr/^{86}Sr$) and urban density are assessed across six Austin, TX watersheds. Increases in F^-, Cl^-, and $^{87}Sr/^{86}Sr$ values in urban stream waters correspond to increases in urban land use throughout the studied watersheds. The least urbanized watershed (8% urban land use) exhibits the smallest range of F^- concentrations (0.40-0.47ppm) and $^{87}Sr/^{86}Sr$ values (0.7080-0.7081), whereas the most urbanized watershed (95% urban land use) exhibits the largest range in F^- concentrations (0.24-0.99 ppm) and $^{87}Sr/^{86}Sr$ values (0.7084-0.7090). Increases in urban stream water F^-+Cl^- concentrations and $^{87}Sr/^{86}Sr$ values are compared to geochemical models for fluid mixing between endmembers (rural stream water, municipal supply water, and waste water). Model results suggest 30-50% municipal supply and/or waste water influence on stream water geochemical composition in the least urbanized watersheds (<10% urban land use), and 10-99% influence on stream water geochemical composition in the watersheds with > 48% urban land use. This municipal (supply and waste) water influence on stream water geochemical composition increases with urban land use, which may be due to 1) increased leakage as pipe network density increases and ages and/or 2) irrigation with municipal supply water. This study demonstrates that municipal (supply and waste) water can enter natural stream water systems and result in geochemical evolution of stream water compositions, and that the significance of this process increases with urbanization.

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